

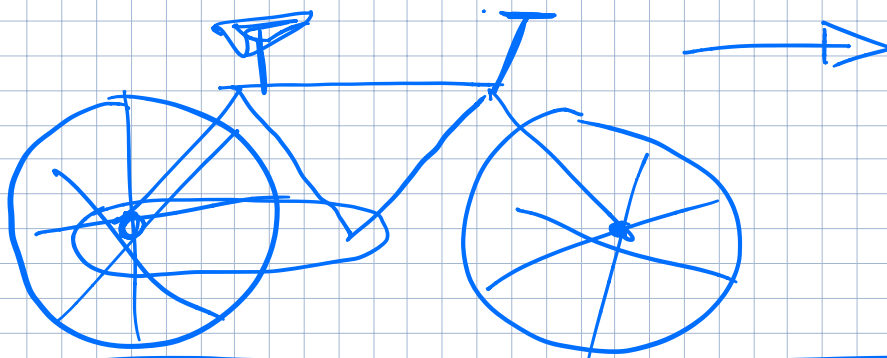
ELL 333

LECTURE

25.07.2018

Example: Bicycle

What are the kind of questions we want to study in this course (and why)?



Objective: Go from point A to point B, without falling.

• Model

What is a model of a bicycle?

... to ... + ...

→ mathematical representation

— it is a useful approximation to the system.

— for bicycles, typical starting point is Newton's laws of motion.

— for us, ordinary differential equations are the primary means of mathematical representation. Others: difference equation, partial differential equations...

→ What are equations of motion for a bicycle?

What are the 'states' of bicycle?

→ x -position

→ tilt with respect to vertical.

& their velocities

→ we want to come up with a model in terms of

- ordinary differential equations
- coupled first order system
- linear (for nonlinear systems, want to linearize)

→ These models can be used

to understand the dynamics and stability properties of the system.

- Design

→ based on the model (one or more)

→ start with specifications

→ are specifications achievable or not with 'full information' (related to controllability/reachability)

→ are specifications achievable with 'partial information'